Site Modifications

1. General guidelines for filling of land are as follows:

a. *Uniformity of fill materials* - Any variability of the fill material used for absorption of sewage effluent will likely cause problems for on site sewage management systems. Fill must not include stumps, logs, rocks, brick, concrete or extraneous materials. Fill material must meet ASTM C-33 Specifications for Fine Aggregate with less than five percent passing a number two hundred sieve, (see section H-6, paragraph 8.). Other fill materials may be acceptable, however, they must have a permeability of between 0.0005 meters per second (m/sec) and 0.00003 (m/sec) at ninety-five percent Standard Proctor Compaction. The simplified falling head permeability test procedure as described in section H-6, paragraph 8. or other ASTM approved testing procedures may be used for determining permeability of fill.

b. *Compaction of Fill* - Fill material must be compacted to a density of undisturbed soil in the proposed absorption field area (90% Standard Proctor Compaction) before the installation of an on site sewage management system can be allowed. This can be done naturally or mechanically. The fill material should be placed in lifts not exceeding 12 inches loose thickness and compacted to the density specified. The County Board of Health may require a Standard Procter Compaction test.

c. *Original soil surface to be plowed* - Heavy topsoil, and black or very dark gray organic topsoil and vegetation must be removed from the fill site area and the exposed underlying soil plowed to prevent formation of an impervious barrier between the fill and natural soil. Plowing of the original soil shall be done only while dry to a depth of six to eight inches, throwing the soil toward the center of the area to be developed. The proper soil moisture must be such that the soil will crumble and not take on a wire form when rolled between the palms. A mold board plow, chisel plow, or chisel teeth mounted on a tool bar attached to the bucket of a backhoe can be used. The backhoe bucket teeth are not satisfactory and must not be used. Once the site is tilled a layer of sand must be placed before it rains on the tilled area. Placement of the fill must be such as not to rut up or compact the tilled area. All work must be done from the up slope side, so as not to compact the down slope area. Fill should be placed with a backhoe or moved around the site with a track type tractor. Wheeled tractors will rut up the site.

d. *Topsoil cover and grass* - A minimum of six inches of a suitable topsoil material shall be placed over the filled area so grass or other suitable vegetation can be established. The area must be seeded and mulched to avoid erosion before the site can be approved.

e. *Fill area sizing and drainage* - There must be a minimum five feet separation between the shoulder of the fill and the nearest absorption trench. The slope of the fill material from the shoulder to the toe of the fill must have a minimum of a five to one slope. There must be at least a one percent slope from the center of the filled area to the shoulder so water will not pond on top of the filled area. Swales and/or other suitable drainage devices shall be used to divert any storm water away from the filled site area.

f. *Sizing and placement of absorption trenches in fill* - The sizing of absorption trenches shall be based on the most restrictive texture encountered within twelve (12”) inches of the original soil surface. Absorption trenches must be installed across the contours of the original site slope.

g. *Certification of filled site* - A soil classifier, registered engineer or registered geologist must submit a statement to the Board of Health certifying that the in place fill and the filled site meet requirements of these guidelines or with Board of Health approval a Level II Certified Environmental Health Specialist trained in fill evaluation may approve in place fill meeting these guidelines.

h. ***Restrictions on the use of area fill -*** The minimum depth of original soil to the seasonal high groundwater table, rock or other restrictive soil horizon shall be twelve (12”) inches. The maximum permeability of the top 12 inches of original soil shall be 30 minutes per inch. Area fill should not be used on sites with slopes that exceed 12%.

2. **General Guidelines for Drainage of Land**
General guidelines for the drainage of land for onsite sewage management are more complex because of the multiplicity of possibilities for design and the potential for intercepting sewage- contaminated water flowing laterally from the absorption field. Drainage is commonly accomplished by either surface drainage is commonly accomplished by either surface drainage or by internal drainage (subsurface drainage).
   a. *Surface Drainage* - This method is often used for handling storm water runoff and should be an important part of any site plan where surface water is expected to pose a problem either by ponding on site or by flowing across the property. Any plan for surface drainage should be developed under the supervision of the appropriate local governing body having responsibility for approving drainage plans. Along with appropriate property easements obtained, there should be provisions for proper installation and continued maintenance of the drainage facilities since lack of maintenance often allows the drainage ways to become clogged with debris, silt, vegetative growth, etc., to the point where conditions are as bad or worse than before the drainage improvement was installed. Surface drainage is often effective in reducing the length of the period of saturation on a site, but is usually not adequate to prevent temporary saturation with resulting localized malfunctioning of absorption fields.
   b. *Subsurface Drainage (Internal Drainage)* - The removal of excess soil water from seasonal high water table elevations or soil saturation caused by natural precipitation is often crucial to proper absorption field operation. In some cases, this may be corrected by installing subsurface drain networks, which remove the excess water as it flows laterally into the drains usually resulting in some lowering of the water level. If the water level can be lowered significantly and to the point where there is vertical separation of the proposed absorption field trench bottoms and the water level, subsurface drainage may be an approvable modification. Many interrelated factors come into play in any drainage plan. Probably the most important variables include the depth of permeable soil and homogeneity of the soil to be drained, depth of water table, availability of gravity flow outlets and frequency of in station of subsurface absorption lines. Any subsurface drainage plan must be prepared and the installation approved by a soil classifier, Agricultural Engineer or other design professional competent in the design of subsurface drainage systems.
   c. Subsurface drainage must be located 10 feet up gradient or 30 feet down gradient from any absorption trench.

3. **Artificially Drained Systems**
High water tables that limit the use of absorption trenches can sometimes be artificially lowered to permit the use of this disposal method. Vertical drains, curtain drains and under drains are commonly used subsurface drainage techniques. Soil and site conditions determine which method is selected (See Tables HT-2 and HT-3).

   Successful design of artificially drained systems depends upon the correct diagnosis of the drainage problem. The source of the groundwater and its flow characteristics must be determined to select the proper method of drainage. Particular attention must be given to soil stratification and groundwater gradients.

   Because each of these drainage problems requires different solutions, it is important that the site evaluation be done in sufficient detail to differentiate between them. Where the need for subsurface drainage is anticipated, topographic surveys, soil profile descriptions and estimation of the seasonally high groundwater elevations and gradients should be emphasized. Evaluation of these site characteristics must be done in addition to evaluation of other site characteristics affecting surface disposal.

4. **Subsurface Drainage Problems**
There are an unlimited variety of subsurface drainage problems but the most common ones can be grouped into four general types. These are (1) free water tables, (2) water tables over artesian aquifers, (3) perched water tables, and (4) lateral groundwater flow problems.
   a) *Free Water Tables*
   Free water tables typically are large, slow-moving bodies of water fed by surface waters, precipitation, and subsurface percolation from other areas. In the lower elevations of the drainage basin, the groundwater is discharged into streams, on the ground surface in low areas, or by escape into other aquifers. The groundwater elevation fluctuates seasonally. The slope of a free water table surface is usually quite gentle. Where the soil is permeable, under-drains can be used to lower the water table sufficiently to permit the installation of trench or bed disposal systems. In fine textured soils of slow permeability, however, subsurface drainage is impractical.
   b) *Water table Over Artesian Aquifer*
   An artesian aquifer is a groundwater body confined by an impervious layer over the aquifer. Their pressure surfaces (the elevation to which it would rise in well tapping the aquifer) are higher than the local water table,

and may even rise above the ground surface. Pressure in the aquifer is caused by the weight of a continuous body of water that is higher than the local water table. Leaks at holes or weak points in the confining layer create an upward flow, with the hydraulic head decreasing in the upward direction. The groundwater moves in the direction of the decreasing gradient and escapes as seepage at the ground surface or moves laterally into other aquifers.

Areas with this problem are impractical to drain. The water removed is continually replenished from the aquifer. This requires relatively deep and closely spaced drains and pumped discharges. Onsite disposal options should be investigated in areas with shallow artesian aquifers.

c) *Perched Water Table*
In stratified soils, a water table may develop that is separated from the free water table by a slowly permeable layer, i.e., a perched water table. This occurs when surface sources of water saturate the soil above the layer due to slow natural drainage. Methods employed to drain perched water tables depend upon the particular site conditions. Vertical drains, curtain drains or under drains may be used. Subsurface drainage may be impractical in fine textured soils of slow permeability.

d) *Lateral Groundwater Flow*
Lateral groundwater flow problems are characterized by horizontal groundwater movement across the area. This flow pattern is usually created by soil stratification or other natural barriers to flow. The depth, orientation and inclination of the strata or barriers determine the drainage method used and its location. Curtain drains or vertical drains are usually employed to intercept the water upstream of the area to be drained.

5. **Selection of Drainage Method**
In designing a subsurface drainage system, the site characteristics are evaluated to determine which method of drainage is most appropriate. Table HT-2 presents the drainage method for various site characteristics. In general, shallow, lateral flow problems are the easiest drainage problems to correct for subsurface wastewater disposal. Since the use of the under drains for onsite disposal systems has been very limited, other acceptable disposal methods not requiring drains should first be considered.

a) *Curtain Drains (See Figure HF-1)*
Curtain drains are placed some distance up slope from the proposed soil absorption system to intercept the groundwater, and around either end of the system to prevent intrusion. On sites with sufficient slope, the drain is extended down slope until it surfaces, to provide free drainage. The drain is placed slightly into the restrictive layer to ensure that all the groundwater is intercepted. A separation distance from the soil absorption system is required to prevent insufficiently treated wastewater from entering the drain. This distance depends upon soil permeability and depth of drain below the bottom of the absorption system; however, a separation distance of 10 ft is commonly used.

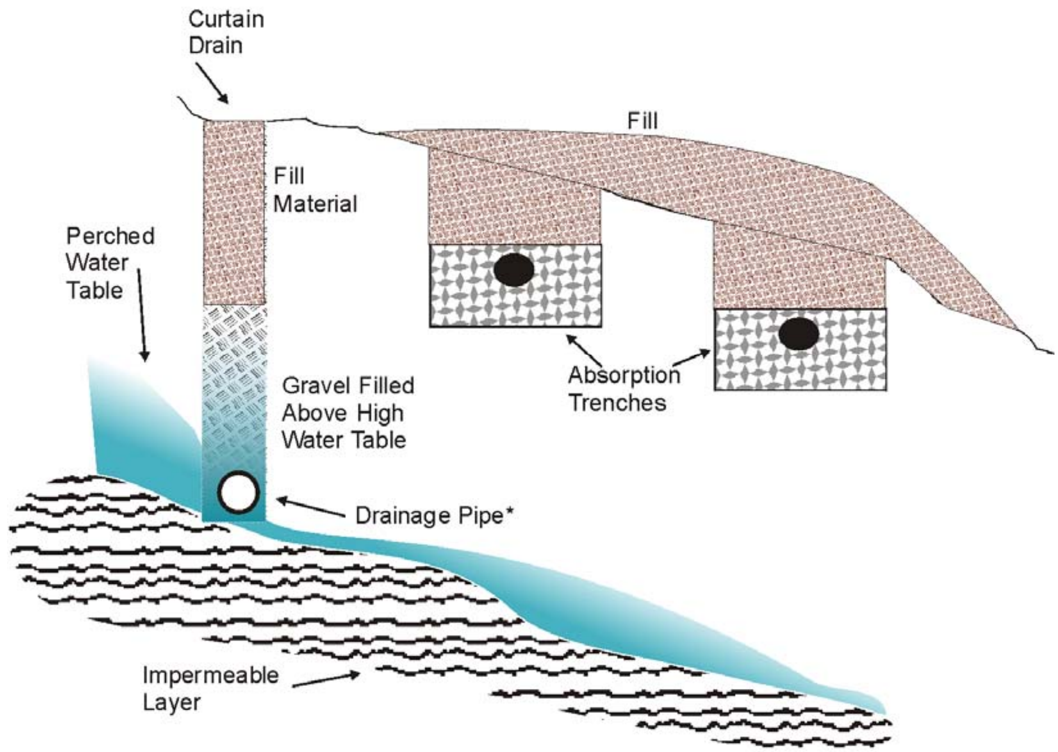
The size of the drain is dependent upon the soil permeability, the size of the area drained, and the gradient of the pipe. Silt traps are sometimes provided in the drain to improve the quality of the discharged drainage. These units may require infrequent cleaning to maintain their effectiveness.

b) *Vertical Drains (See Figure HF-2)*
Vertical drains may be used to intercept a laterally flowing perched water table. Separation distances between the drain and the bottom of the absorption field are the same as for curtain drains to maintain an unsaturated zone under the absorption field.

The size and placement of the drain depends upon the relative permeability of the saturated soil and the soil below the restrictive layer, and the size of the area to be drained. The infiltration surface of the vertical drain (side walls and bottom area) must be sized to absorb all the water it receives. The width and depth of the drain below the restrictive layer is calculated by assuming an infiltration rate for the underlying soil. If clay and silt are transported by the groundwater, the infiltration rate will be less than the saturated conductivity of the soil. Clogging of the vertical drain by silt can be a significant problem. Unfortunately, experience with these drains in wastewater disposal is lacking.

c) *Under drains (See Figure HF-3)*
Under drains are used to lower the water table when the table is 4 to 5 ft. (1.2 to 1.5m) below the surface in permeable soils. This also provides the necessary depth of unsaturated soil below the infiltrative surface of the soil absorption system, and to prevent poorly treated effluent from entering the drain. Sometimes, a network of drains is required throughout the area where the absorption field is located. The depth and spacing of the drains is determined by the soil permeability, the size of the area to be drained, and other factors.

Figure HF-1
Curtain Drain to Intercept Laterally Moving Perched Water Table
Caused by a Shallow Impermeable Layer



*Joints or perforations should be covered by treated building paper or pipes jacketed with mesh

Figure HF-2
Vertical Drain to Intercept Laterally Moving Perched Water Table
Caused by a Shallow Thin Impermeable Layer

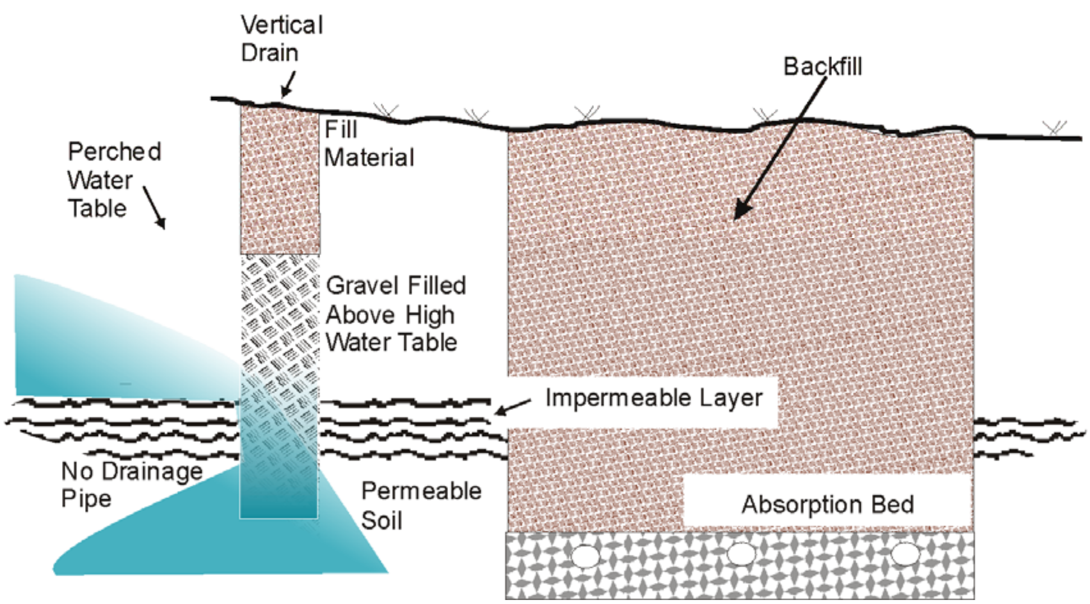
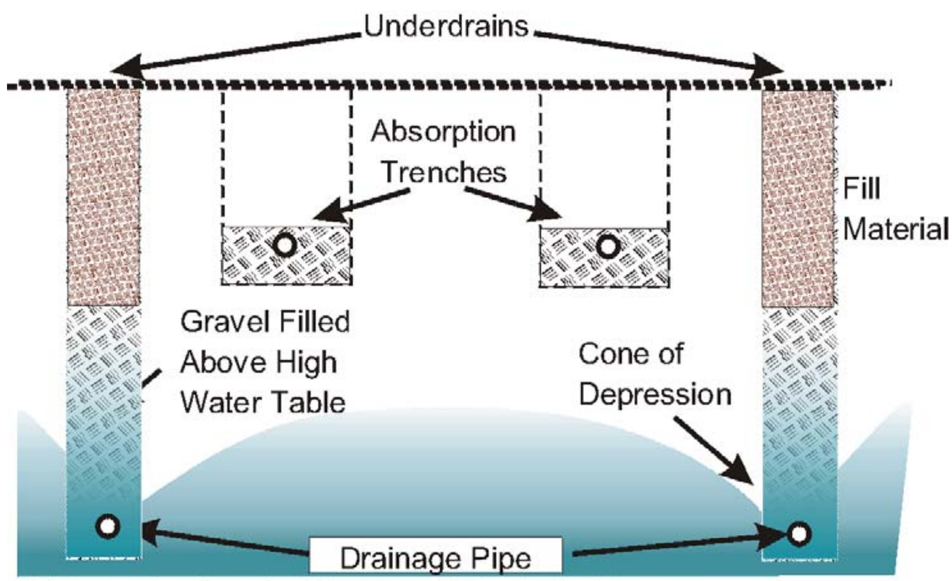


Figure HF-3
Underdrain Used to Lower Water Table



Joints or perforations should be covered by treated building paper or pipes jacketed with mesh

Table HT-1
Drainage Methods for Various Site Characteristics

Drainage Problem	Site Characteristics	Drainage Method
a) Free Water Table	Deep uniform soils molted of saturated	Underdrain[2]
b) Artesian-Fed Water Table	Saturated Soils above and below restrictive layer with hydraulic gradients increasing with depth	Avoid
c) Perched Water Table	Saturated or mottled soils above a restrictive layer, soil below restrictive layer is unsaturated; site is level or only gently sloping	Underdrain[2] Vertical Drain[1]
d) Lateral Flow	Saturated or mottled soils above a restrictive layer with water source located at a higher elevation; site usually sloping	Curtain drain Vertical drain[1]

[1]Use only where restrictive layer is thin and underlying soil is reasonably permeable.
[2]Soils with more than 70% clay are difficult to drain and should be avoided.

Table HT-2

Use of Subsurface Drains
To Control Ground Water Table

Suitable Soils To Place Subsurface Drains		**Depth to Wetness Mottles (gray colors)**	**Depth of water table after drainage (Inches)**			
			Drain Spacing			
Inches	**Soils**	Inches	120ft.	100ft.	70ft.	50 ft.
60	Barth Chipley Lyn Haven Ousley Leon Mandarin St. Johns	24	48	50	54	55
50	Albany (klej Sand) Goldsboro Izagora Johns Lynchburg Ona Plummer Sapelo	24	39	40	41	42
40	Bodine Leefield (Klej Shallow) Kanapuha Mascotte Ocilla Olustee Pelham (Weston, thick surface, drains) Rains Rigdon Seneca Stilson	24	30	33	35	36
36	Clarendon Irvington Hazlehurst	24	22	23	24	26

*Suitable-sandy or loamy soils (5 to 35 percent clay)

6. **Mound System Modification**

When slowly permeable soils exist and or rock formations or high, ground water elevations prohibit issuance of permits for conventional on-site sewage management systems, a mound system may be considered. Construction of such systems shall be in accordance with design standards found in the "Wisconsin Mound Soil Absorption System Siting, Design and construction Manual, January, 1990 edition. See Section **F** for a copy of this design manual and other acceptable pressure dosing alternatives. Site preparation and suitability of the in-place fill materials used must be certified by a soil classifier, registered engineer or registered geologist as meeting the above criteria before-on-site sewage management construction permits can be issued by the Board of Health.

7. **Alternative Distribution System Specifications**

The distribution system in an elevated sand mound shall consist of three components:

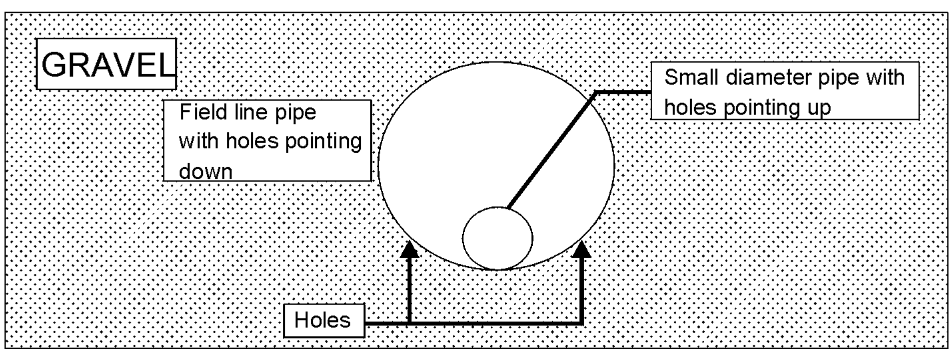
a) Pressurized distribution manifold - that shall consist of a small diameter (1" - 1.5") schedule 40 pipe, to receive the effluent from the pump. This pipe shall be connected as to not create any dead ends, and shall have 3/8" holes drilled in it every 36" pointing up. The effluent from the pump must come to the center of this distribution manifold and absorption area.

b) Field drainpipe to house the pressurized distribution manifold - A 4" field line pipe with the holes pointing down is acceptable. Other field drainpipe designs may be acceptable, but first must go through the experimental protocol.

c) Distribution media - ½" to 2" gravel to a depth of 1ft. is acceptable. The design of the absorption area must comply with design guidelines for gravel underground absorption. If other distribution media are approved, they must comply with the appropriate regulations and guidelines.

FIGURE HF-4

SIDE VIEW OF DISTRIBUTION SYSTEM IN ABSORPTION AREA OF AN ELEVATED SAND MOUND



8. Simplified Falling-Head Permeameter Test for Fill Material for Disposal Fields.

The permeameter consists of a Plexiglas clear plastic tube with one end covered by a fine mesh screen. The cylinder is stood in a low plastic container with a layer of filter fabric at the bottom to allow free exit of permeating water. The details and general arrangement of the apparatus are shown in Figure HF-5.

Approximately 60 mm. of the sand to be tested are filled into the cleaned cylinder and compacted by allowing the cylinder to fall 200 mm. five times onto the workbench. More sand is added to the 110 mm. mark and again compacted. The cylinder is then placed in the container and the sand flooded from the bottom up to drive out any air. After allowing the wet sand to drain excess water, the sample is again compacted by dropping five times and the sample is trimmed to a finished height of 100 mm. using a suitable scraper.

The cylinder is now returned to the container, flooded from the bottom up and then water is carefully poured into the top of the cylinder above the upper reference mark. The water level is now allowed to fall, noting the time in minutes that it takes to pass over the 50 mm. gauge length. Measure or judge the temperature of the water used in the test. Now refer to the chart in Figure HF-6 to determine the apparent permeability.

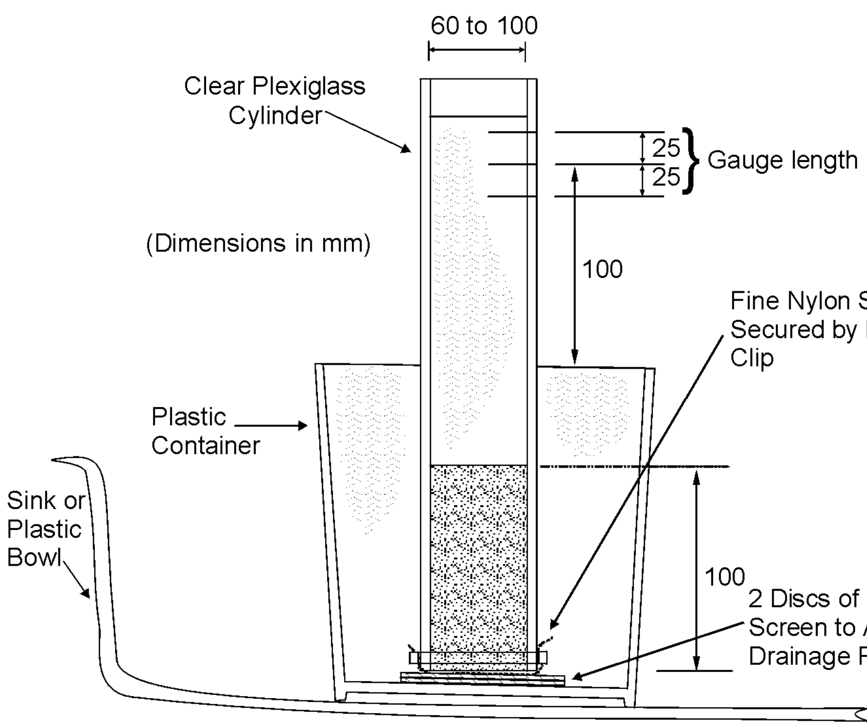


Figure HF-5 **Falling Head Permeameter - Apparatus**

FILLED SITE CERTIFICATION FORM

Property Owners Name ____

Property Owners Address ____

Phone Number ____________________ Alternate #______________________

Location and address of the property _________________________________

____

1) Topsoil and vegetation has been removed from filled area. Yes _____ No_____
2) Filled area has been properly tilled. Yes _____ No ____
3) The fill material used on the site is coarse/med sand that meets fill regulations.
Yes _____ No ____
4) The proper amount of fill material has been properly placed on the site to construct the absorption field area to comply with distance regulation for the slope fringe area.
Yes_____ No ____
5) The filled area has been properly constructed and has a 5 to 1 slope. Yes_____ No ____
6) Is there proper surface water control around the filled site (i.e., swales, gutters on house, ditches, or other methods specified for proper drainage? Yes_____ No ____
7) Is there enough good quality topsoil on the site to be used as SIX INCHES of cover on the entire absorption field including slope? Yes ____ No_____
8) Are there any other considerations that should be addressed that may cause on-site sewage system installed in this fill area to fail prematurely or if you answered any of the above comments by checking NO, please explain below:

____

____

____

____

____

____

____

____

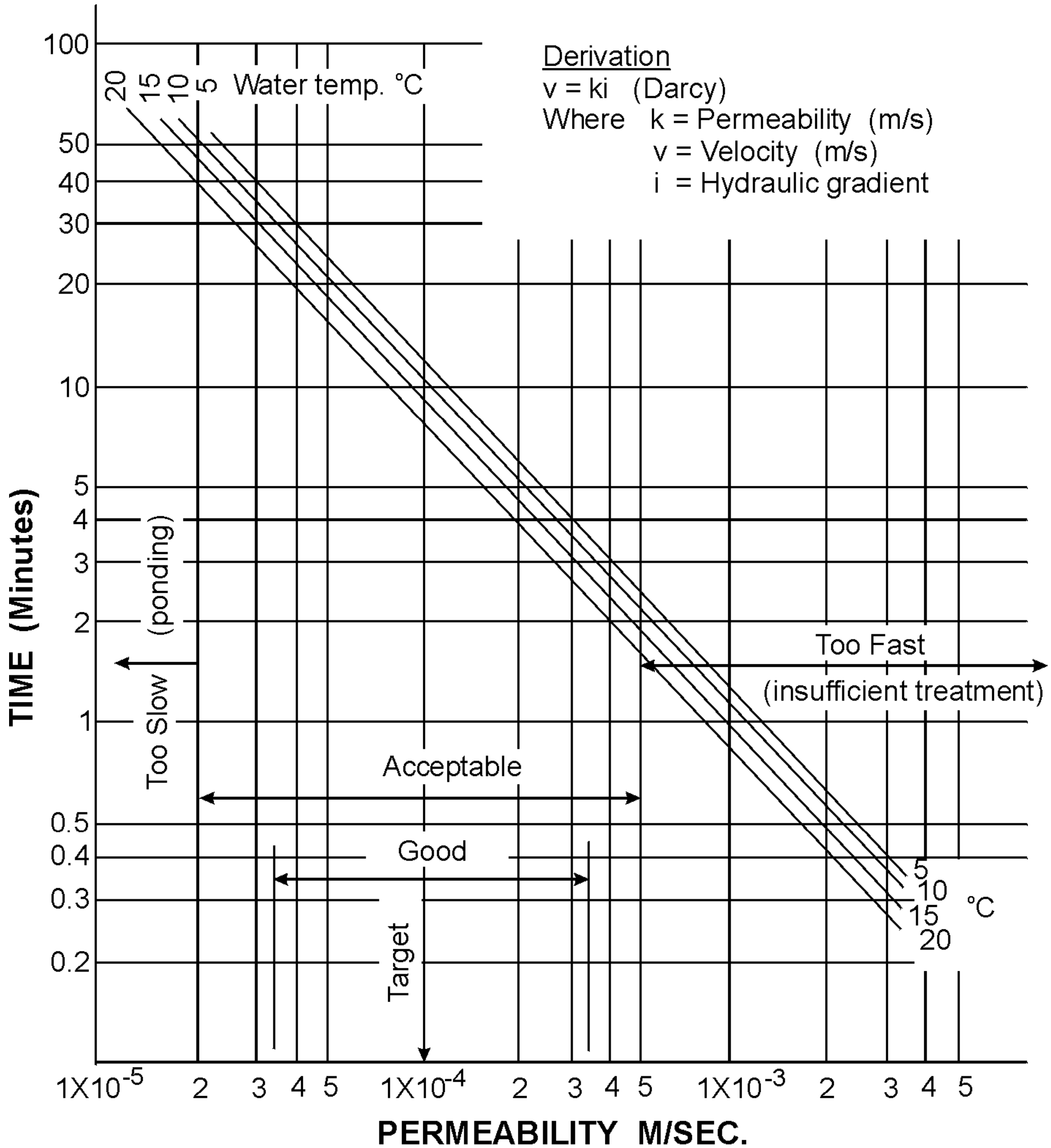
(All site modifications must be maintained for life of system.)

9) The soil type on this site is ______________________.
10) The fill soil has a percolation rate of (Estimated)________________
11) The size of the fill site is __________ft. x _________ ft.
12) The height of the fill area is ______________ inches.

PLEASE CHECK ONE OF THE FOLLOWING:
The fill site is:
APPROVED ________ **DISAPPROVED** _______ (See above comments)
I certify that the information on this document is true.

____________________________ ____________________________
Signature of Certified Soil Classifier Date

Print Name/Phone Number ____



Falling Head Permeameter
Permeability Chart
Figure HF-6